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Attention: EXAMINER RUDY ZERVIGNON
Phone: (571) 272-1442

TC 1700 PERSONNEL: THE DOCUMENT TO FOLLOW IS A

RESPONSE AFTER FINAL

including:

- [ ] Response under 37 CFR §1.116
- [ ] Notice of Appeal
- [X] Appeal Brief under 37 CFR §1.192 (filed in triplicate)
- [ ] Reply Brief under 37 CFR §1.193(b)(1) (filed in triplicate)
- [ ] Continued Prosecution Application (CPA) Request Transmittal
- [ ] Other: Fee Transmittal Form

for filing in **U.S. Patent Application Serial No. 09/624,810**

SPECIAL STATUS

CERTIFICATE OF FACSIMILE TRANSMISSION
I hereby certify that this paper is being facsimile transmitted to the Patent and Trademark Office on the date shown below.

Gary M. Hartman — August 23, 2004 (Date)

FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 330.00

Complete if Known	
Application Number	09/624,810
Filing Date	July 24, 2000
First Named Inventor	Bruce
Examiner Name	R. Zervignon
Art Unit	1763
Attorney Docket No.	13DV-13228

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☑ Deposit Account:

Deposit Account Number: 07-0865

Deposit Account Name: General Electric Company

The Director is authorized to: *(check all that apply)*

☑ Charge fee(s) indicated below ☑ Credit any overpayments

☑ Charge any additional fee(s) or any underpayment of fee(s)

☐ Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($) 0.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

	Extra Claims		Fee from below	Fee Paid
Total Claims		- 20** =	X	=
Independent Claims		- 3** =	X	=
Multiple Dependent				=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	86	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0.00

** or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	330.00
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,330	2453	665	Petition to revive - unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify)

*Reduced by Basic Filing Fee Paid SUBTOTAL (3) ($) 330.00

SUBMITTED BY

(Complete *if applicable*)

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Signature				Date	August 23, 2004

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	09/624,810	Confirmation No. **6522**
Applicant	:	Robert W. Bruce et al.	
Filed:	:	July 24, 2000	
TC/Art Unit:	:	1763	
Examiner	:	Rudy Zervigon	
Docket No.	:	13DV-13228	
Customer No.	:	30952	

APPEAL BRIEF UNDER 37 CFR §1.192

Assistant Commissioner for Patents
Washington, D.C. 20231

This is an appeal from the Examiner's final rejection made in an Office Action dated March 24, 2004 (Paper No. 20040311), of claims pending in the above-identified US patent application. This Brief is being filed in triplicate. Please charge the requisite fee and any other necessary charges to the General Electric Company, Deposit Account No. 07-0865, per attached Appendix B. A correct copy of the rejected claims is set forth in the attached Appendix A.

(1) REAL PARTY IN INTEREST

The sole assignee of the above-identified patent application is the General Electric Company.

(2) RELATED APPEALS AND INTERFERENCES

There are no pending appeals or interferences known to Appellants or Appellants' assignee or Appellants' representative that would directly affect or be directly affected by or have a bearing on this appeal regarding the above-identified patent application.

(3) STATUS OF THE CLAIMS

Claims 1-8 were originally presented in this application. Claims 9 and 10 were introduced by an amendment filed May 17, 2002 (Paper No. 6). Claims 1-10 are currently pending in the application, and are the subject of this appeal.

(4) STATUS OF AMENDMENTS

Following the final rejection of March 24, 2004, Appellants filed a response under 37 CFR §1.116, on May 25, 2004, without amendments to the claims. In an Advisory Action filed June 18, 2004 (Paper No. 20040616), the Examiner indicated that "the proposed amendment(s) will not be entered." However, as Appellants did not amend the claims subsequent to the final rejection, this statement is erroneous.

(5) SUMMARY OF THE INVENTION

As stated at Page 1, Lines 6-12, of their specification, Appellants' invention is directed to an electron beam physical vapor deposition (EBPVD) coating apparatus adapted to deposit ceramic coatings on components, such as thermal barrier coatings on superalloy components of gas turbine engines. A coating apparatus (10) of this type can be most readily understood from Appellants' Figures 1, 2 and 6, which portray the apparatus (10) as having a coating chamber 12 containing at least one ingot (26) of a ceramic material to be deposited. The apparatus (10) directs an electron beam (28) onto the ingot (26) to melt and evaporate the surface of the ingot (26). Intense heating of the ceramic material by the electron beam (28) causes the surface of the ingot (26) to melt, forming a molten ceramic pool (generally, the entire upper surface of the ingot 26) from which molecules of the ceramic material evaporate, travel upwardly, and then deposit on surfaces of components (20) desired to be coated. Page 11, Lines 18-33.

Appellants' invention is more particularly directed to an improved electron beam pattern (EB pattern) projected on the coating material (ingot 26) by the electron beam (28). Page 5, Lines 22-24. The EB pattern is described in detail starting at line 1 of page 21 and continuing through line 4 of page 23, with reference to Figures 10, 11 and 12. As seen in Figure 10, the ingot 26 is fed upward through a crucible 56 that contains the molten pool of ingot material. Page 19, Lines 27-30.

Figure 12 shows a preferred power distribution (98) for the electron beam (28) on the molten pool at the upper surface of the ingot (26). The power distribution (98) has peaks

located at the ingot-crucible interface, with little or no power aimed at the center of the ingot (26). According to Appellants' invention, the benefit of directing such high beam intensities away from the center of the molten pool is a reduced tendency for spitting, which is generally when a droplet of molten ceramic is ejected from the pool during coating. Spitting is associated with coating defects, and therefore is preferably avoided. Page 21, Lines 8-19.

Because the power distribution (98) has peaks located at the ingot-crucible interface, Figures 10, 11 and 12 show the beam (28) as not only being projected onto the molten pool of the ingot (26), but as also being projected onto that portion of the crucible surface (84) immediately surrounding the ingot (26), such that the perimeter of the beam (28) is projected directly onto the crucible surface (84). Page 21, Lines 1-7. Appellants have determined that projecting the electron beam (28) onto the crucible surface (84) serves to reduce the amount of ceramic that might otherwise buildup on the crucible (56) due to spitting, and also provides a more even temperature distribution across the molten pool as determined with infrared imaging. Page 21, Lines 19-24.

Figure 10 shows the electron beam (28) incident on the surface of the ingot (26) at an oblique angle so as to establish relative to its EB gun (30) a proximal intersection point (100) and an oppositely-disposed distal intersection point (101) with the crucible (56) at the perimeter of the beam pattern. As shown in Figure 11, the beam pattern intensity on the ingot (26) and crucible (56) slightly diminishes at locations on the crucible (56) corresponding to the proximal and distal intersection points (100 and 101). According to Appellants' invention, the purpose of reducing the intensity of the beam pattern at the proximal intersection point (100) is to reduce

erosion of the crucible (56) by the electron beam (28), while reducing the beam intensity at the distal intersection point (101) reduces waves generated by the beam (26) on the molten pool from pushing molten ceramic over the edge of the crucible (56). Page 21, Line 29-Page 22, Line 13.

Another preferred control feature of Appellants' invention is the ability to temporarily interrupt the beam pattern on the surface of the crucible (56) with a separate higher-intensity beam pattern (97) dedicated to achieving a faster evaporation rate over a small area in order to evaporate any ceramic that deposits on the crucible (56) as a result of spitting. This feature of the invention is depicted in Figures 11 and 12. Page 22, Line 14-Page 23, Line 4.

In summary, Appellants teach and claim an EBPVD coating apparatus (10) operated to project an electron beam (28) having a higher intensity at the interface between the molten surface of the ingot (26) and the surrounding crucible (56) than within the central region of the molten surface. According to its ordinary meaning, the term "interface" is understood to mean the locus of points where two things meet and interact, and therefore does not describe locations that are merely between the center of the molten surface and the edge of the crucible (56). Instead, Appellants' invention is directed to an EB pattern with a higher intensity on the surface of the molten pool where the pool meets or contacts the crucible (56), and more preferably on the surface of the crucible (56) immediately adjacent the molten pool, as shown in Figures 11 and 12.

For the convenience of the Board, the independent claims under appeal are

reproduced below, with the reference numeral of each element as denoted in the specification and drawings set forth in parentheses.

Claim 1: An electron beam physical vapor deposition coating apparatus **[10]** comprising:

a coating chamber **[12]** at an elevated temperature and a subatmospheric pressure;

a crucible **[56]** within the coating chamber **[12]**;

a coating material **[26]** surrounded by and contained within the crucible **[56]**, the coating material **[26]** having a surface exposed by the crucible **[56]**;

an electron beam gun **[30]**; and

an electron beam **[28]** projected onto the surface of the coating material **[26]** by the electron beam gun **[30]**, the electron beam **[28]** defining a beam pattern having a higher intensity at an interface of the surface of the coating material **[26]** with the crucible **[56]** than at a central region of the surface of the coating material **[26]**.

Claim 6: An electron beam physical vapor deposition coating apparatus **[10]** comprising:

a coating chamber **[12]** containing a coating material **[26]**, the coating chamber **[12]** being at an elevated temperature and a pressure greater than 0.010 mbar;

a crucible **[56]** within the coating chamber **[12]**;

a coating material **[26]** surrounded by and contained within the crucible **[56]**, the coating material **[26]** having a surface exposed by the crucible **[56]**;

an electron beam gun **[30]**; and

an electron beam **[28]** projected by the electron beam gun **[30]** onto the surface of the coating material **[26]** and a contiguous surface portion **[84]** of the crucible **[56]**, the electron beam **[28]** forming a beam pattern with a perimeter on the contiguous surface portion **[84]** of the crucible **[56]**, the electron beam gun **[30]** melting the surface of the coating material **[26]** and evaporating molten coating material **[26]**, the electron beam **[28]** having a higher intensity at an interface of the surface of the coating material **[26]** with the contiguous surface portion **[84]** of the crucible **[56]** than at a central region of the surface of the coating material **[26]**, the electron beam **[28]** being incident on the surface of the

coating material **[26]** at an oblique angle so as to establish relative to the electron beam gun **[30]** a proximal point **[100]** and an oppositely-disposed distal point **[101]** at the perimeter of the beam pattern, the electron beam **[28]** having a lower intensity at the proximal and distal points **[100,101]** than elsewhere at the perimeter of the beam pattern.

(6) ISSUES

The issues presented for review are as follows:

a) Whether Claims 1-4, 6, 7, 9 and 10 are patentable over U.S. Patent No. 4,988,844 to Dietrich et al. (Dietrich) applied under 35 USC §102.

b) Whether Claims 5 and 8 are patentable over Dietrich applied under 35 USC §103.

(7) GROUPING OF CLAIMS

Appellants respectfully traverse the Examiner's final rejection of:

a) Claims 1 and 2 under 35 USC §102 in view of Dietrich;

b) Claim 3 under 35 USC §102 in view of Dietrich;

c) Claim 4 under 35 USC §102 in view of Dietrich;

d) Claims 6 and 7 under 35 USC §102 in view of Dietrich;

e) Claims 9 and 10 under 35 USC §102 in view of Dietrich; and

f) Claims 5 and 8 under 35 USC §103 in view of Dietrich.

Appellants respectfully request that the claims stand and fall as grouped above.

(8) ARGUMENT

Rejection under 35 USC §102

Provided immediately below is a discussion of the prior art applied in the 35 USC §102 rejection of the claims under appeal, followed by remarks individually directed to the claims as grouped under this rejection. In addressing the §102 rejection as it applies to each group of claims, Appellants rely on MPEP §2131, which states:

> A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. The identical invention must be shown in as complete detail as is contained in the ...claim. The elements must be arranged as required by the claim, but this is not an ipsissimis verbis test, i.e. identity of terminology is not required. (Citations omitted).

Before proceeding, Appellants wish to point out that, whereas the final rejection (Office Action of March 24, 2004), states that a declaration under 37 CFR 1.132 was insufficient to overcome the 35 USC §102 rejection based on Dietrich (paragraphs 1-3 of the Office Action), Appellants did not submit the declaration for this purpose. Instead, Appellants submitted the declaration to overcome a public-use/on-sale bar, and the declaration was successful for this purpose (paragraph 11 of the Office Action). In view of the above, the sufficiency of the declaration is not an issue in this Brief.

Dietrich et al. ("Dietrich"), U.S. Patent No. 4,988,844

Dietrich discloses an electron beam melting furnace equipped with electron beam guns 10 and 11 that generate electron beams 17 and 18, each of which is deflected at an angle

from the axis of its gun 10/11 by x and y-deflecting systems 12 and 13 (Column 2, Lines 10-12 and 51-57; Figure 1). The deflecting systems 12 and 13 are operated to cause the beams 17 and 18 to strike a cylindrically-shaped consumable electrode 4 and the surface 9 of a bath 8 of molten evaporate that collects in a crucible 6 beneath the electrode 4 (Column 3, Lines 6-11; Figure 1; see also Column 1, Lines 35-44; and Column 1, Line 62-Column 2, Line 7).

Each of the beams 17 and 18 is pivoted in a semicircle (Column 3, Lines 37-38; Figures 1, 2 and 3). The means for causing this pivoting of the beams 17 and 18 is not stated, but is presumed to be the deflecting systems 12 and 13. In any event, the electrode 4 is melted off through the semicircular paths of the electron beams 17 and 18 (Column 3, Lines 10-11).

Each electron beam 17 and 18 projects a semicircular-shaped "strike area" (beam pattern) 26/27 onto one half of the surface 9 of the bath 8, and these halves are separated by an axis of symmetry 16 (Column 3, Lines 1-2, 11-14, and 38-39; Figures 1 and 2). The beam patterns 26 and 27 are entirely located between the axis of symmetry 16 of the bath 8 and the perimeter of the bath 8 nearest its gun 10/11 (Figures 1, 2 and 3). As a result, each beam pattern 26/27 has a continuous proximate region 36/37 (nearest its gun 10/11) between oppositely-disposed terminal portions 30/32 or 31/33, with the result that the terminal portions 30 and 31 face each other at one lateral side of the combined beam pattern 26-27, while the terminal portions 32 and 33 face each other at the other lateral side of the combined beam pattern 26-27 (Column 3, Lines 44-50; Figure3).

According to Dietrich, an ion concentration in the area of the electrode 4 causes the electron beams 17 and 18 to "shift[] in the direction of arrows, 20, 21 toward the electrode [4]"

(Column 3, Lines 15-18). Unfortunately, there are *two* sets of arrows 20 and 21 shown in Figure 1 (the arrows 20 and 21 are not shown in Figures 2 and 3), and these sets of arrows point in opposite directions: the upper arrows 20/21 point *toward* the electrode 4, while the lower arrows 20/21point *radially outward* and away from electrode 4. However, because Dietrich clearly states that "the electron beams 17, 18, on the basis of an ion concentration in the area of electrode 4, are shifted in the direction of arrows, 20, 21 toward the electrode" (Column 3, Lines 15-18; emphasis added), it is incontrovertible that Dietrich intended to refer to the beams 17 and 18 as being shifted by the ion concentration *toward* the electrode 4 in accordance with the *upper* arrows 20 and 21in Figure 1.

Because the above-noted shifting of the beams 17 and 18 causes the actual radial deflection of the electron beams 17 and 18 to no longer correspond to the deflection preset by the deflection systems 12 and 13, Dietrich explains that the electrode 4 is no longer melted off in an orderly manner at its lower end by the electron beams 17 and 18 (Column 3, Lines 19-24). Dietrich then states:

> To position the electron beams 17, 18, accurately in their theoretical optimum positions despite the force urging them radially toward the outside, the actual positions of the beams are determined according to the invention and are adjusted according to the theoretical desired positions.
>
> Dietrich at Column 3, Lines 25-30.

Dietrich's invention is then set forth as an setup 22 and 23 for determining the actual positions of the beams 17 and 18, and then adjusting their positions to compensate for the shifting caused by the ion concentration surrounding the electrode 4. However, the preceding quote from

Dietrich confuses the intended effect of Dietrich's setup 22 and 23. Specifically, Dietrich teaches that "the electron beams 17, 18, on the basis of an ion concentration in the area of electrode 4, are shifted in the direction of arrows, 20, 21 toward the electrode" (Column 3, Lines 15-18), but then refers to "*the force urging [the electron beams 17, 18] radially toward the outside*" (Column 3, Lines 26-27). Appellants believe that this inconsistency can only be resolved by interpreting the term "outside" as being in reference to the direction away from the gun 10/11 from which the beam 17/18 is projected as a result of deflection by the deflecting systems 12 and 13. In other words, attempting to reconcile the passages at Column 3, Lines 15-18 and 26-27, Appellants believe that "the electron beams 17, 18, on the basis of an ion concentration in the area of electrode 4, are shifted in the direction of arrows, 20, 21 toward the electrode [4]," and thereby "radially toward the outside" relative to their respective guns 10 and 11, i.e, at a greater angle than intended by the deflecting systems 12 and 13.

(1) The Rejection of Claims 1 and 2 in view of Dietrich

Appellants' independent Claim 1 recites an electron beam physical vapor deposition coating apparatus [10] that requires:

> a crucible [56] within the coating chamber [12];
> a coating material [26] surrounded by and contained within the crucible [56], the coating material [26] having a surface exposed by the crucible [56];
> an electron beam gun [30]; and
> an electron beam [28] projected onto the surface of the coating material [26] by the electron beam gun [30], the electron beam [28] defining a beam pattern having a *higher intensity* at an *interface* of the surface of the coating material [26] with the crucible [56] than at a

central region of the surface of the coating material [26].

(Emphasis added.)

Contrary to Claim 1, Dietrich does not disclose that either of the electron beams 17 and 18 has a higher intensity *at the interface* of the surface 9 of the molten bath 8 with the crucible 6 than at a central region of the bath surface 9. Instead, Dietrich discloses and shows the beam patterns 26 and 27 as centrally located about the bath's axis of symmetry 16, and are never projected near or onto the perimeter of the bath 8, as evident from Dietrich's Figures 1, 2 and 3. Furthermore, because Dietrich's electrode 4 unintentionally shifts the electron beams 17 and 18 *toward the electrode 4* (Column 3, Lines 15-18), Dietrich's setups 22 and 23 are only required to counteract this shift (Column 3, Lines 25-31), i.e., the setups 22 and 23 shift the beams 17 and 18 in a radial outward direction relative to the electrode 4 so as to reestablish the intended paths of the beams 17 and 18.[1] In response to this argument, which Appellants made in their responses filed May 25, 2004, September 30, 2002, and May 17, 2002, the Examiner has argued that

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[1] In the Advisory Action, the Examiner states:

> Applicant further argues that Dietrich's "radial outward" direction is in the direction of Dietrich's arrows 20,21. The Examiner disagrees. Dietrich's "radially outward" description is with reference to the outer bound of Dietrich's molten bath where Applicant's "interface" resides.

However, in making this argument, the Examiner does not make any attempt to reconcile the contradiction between Lines 15-18 and Lines 25-30 in Column 1 of Dietrich. In contrast, Appellants believe they have reconciled this contradiction in their extensive discussion of Dietrich.

> Dietrich et al teaches the capability (column 2, lines 53-58; "despite the force urging them radially toward the outside"; column 3, lines 25-30) of projecting each electron beam onto a surface portion of the crucible contiguous with the "bath of molten evaporate" (column 2, lines 40-55).
>
> Office Action of March 24, 2004, page 3.

At pages 5 and 6 of the final rejection (Office Action of March 24, 2004), the Examiner elaborated on this "capability" argument. However, each of the Examiner's explanations for this "capability" is based on operating Dietrich's deflecting systems 12 and 13 in a manner that is not disclosed or suggested by Dietrich. Therefore, even if Dietrich's apparatus is theoretically "capable" of operation in the manner described by the Examiner, Dietrich does not disclose, either expressly or inherently, such an operation or any reason for operating Dietrich's apparatus in the manner claimed by Appellants, namely, projecting either of the electron beams 17/18 onto the bath-crucible interface. Accordingly, the Examiner's rejection is not sanctioned by MPEP §2131, i.e., a rejection under 35 USC §102 must be based on what Dietrich discloses (expressly or inherently), and not on what Dietrich's apparatus could do if modified for a reason suggested only by the Examiner.

In any event, the Examiner's suggestion to operate Dietrich's deflecting systems 12 and 13 to cause the electron beams 17/18 to be projected onto the bath-crucible interface is contrary to the operation of Dietrich's apparatus, which melts the electrode 4 by striking the electrode 4 with two electron beams 17 and 18. If Dietrich's apparatus were operated in the manner proposed by the Examiner, it is apparent from Figure 1 that the beams 17 and 18 would no longer strike the electrode 4, rendering the apparatus inoperable for its intended use.

Accordingly, it cannot be said that Dietrich discloses an apparatus "capable" of operating in the manner recited in Appellants' Claim 1.

In view of the above, Appellants believe that the Examiner's conclusion regarding the "capability" of Dietrich's apparatus is speculative at best, and furthermore is contrary to Dietrich's express teachings regarding the operation of the apparatus.

In response to the latter argument, the Examiner has argued:

> Applicant states that Dietrich's apparatus cannot project Dietrich's electron beams at Applicant's "interface" because Dietrich states "In electron beam melting units, it is important that the electron beam does not strike beside the material to be melted.", [sic] however, with respect to Dietrich's apparatus, Dietrich's statement does not directly translate to Dietrich's apparatus. Dietrich's "material to be melted" is his bath 9 [sic, bath 8], how can you not strike "beside the material"? To the contrary, as is further demonstrated by Dietrich that his electron beams can strike the "interface", Dietrich states "Thus, for example, the evaporation energy sources of the electron beam can be moved over the surface of the material to be evaporated such that as even a surface temperature as possible is reached on a specific surface, and therefore, a constant evaporation rate is maintained ." (column 1, lines 18-25).
>
> Advisory Action of June 18, 2004, page 2.

Appellants respond that the above arguments do not rebut Appellants' argument for the following reasons:

(1) The Examiner does not cite anything from Dietrich for the argument that "Dietrich's statement does not directly translate to Dietrich's apparatus." Therefore, the Examiner's argument is apparently based on the logic that, because "Dietrich's 'material to be melted' is his bath 9 [sic, bath 8], how can you not strike 'beside the material'?" However,

Appellants are not merely claiming that their beam 28 "strikes beside the material," but instead claims their beam 28 strikes the *interface between* the material and crucible. This distinction is of significance because, in arguments made in the final rejection, the Examiner inexplicably substitutes the term "location" for the term "interface" used in Appellants' Claim 1, such that the Examiner's argument is

> Each electron beam gun having a higher intensity at a *location* between the surface of the coating material and the crucible than at a central region of the surface of the coating material. (Emphasis added.)
>
> Office Action of March 24, 2004, paragraph 5 (top of page 3) and paragraph 9 (top of page 7).

In doing so, the Examiner has intentionally and unfairly broadened the meaning of the term "interface" to mean any region of the bath surface 9, instead of the locus of points where the crucible 56 and the surface of the molten ceramic material 26 meet.

(2) The passage cited by the Examiner from Column 1, Lines 18-25, of Dietrich does not alter the fact that evaporation is by melting of the electrode 4, and nothing in Dietrich suggests deflecting Dietrich's electron beams 17 and 18 with the deflecting systems 12 and 13 to the extent that the beams 17 and 18 are projected onto the bath-crucible interface and, consequently as evident from Figure 1, no longer projected onto the electrode 4.

In summary, Appellants believe that Dietrich's electron beam apparatus is not disclosed as operating or even capable of operating in a manner that results in the electron beams 17 and 18 defining beam patterns 26 and 27 having regions of higher intensity located at the

interface of the bath surface 9 with the crucible 6 than at a central region of the surface 9 of the bath 8. Therefore, Appellants believe that Dietrich fails to disclose, either expressly or inherently, Appellants' invention as it is recited in Claim 1. Because Claim 2 depends from Claim 1, Appellants believe that Dietrich also fails to disclose, either expressly or inherently, Appellants' invention as it is recited in Claim 2. Therefore, Appellants respectfully request that this Honorable Board of Appeals reverse the Examiner's rejection of Claims 1 and 2 under 35 USC §102.

(2) The Rejection of Claim 3 in view of Dietrich

Claim 3 depends from Claim 1, and introduces the additional limitation that

> the electron beam [28] is also projected onto a surface portion [84] of the crucible [56] contiguous with the surface of the coating material [26], the beam pattern having a higher intensity on the surface portion [84] of the crucible [56] than at the central region of the surface of the coating material [26].

In view of the arguments set forth above regarding Dietrich's failure to locate the beam patterns 26 and 27 anywhere but within the central region of Dietrich's bath 8, it follows that Dietrich also fails to disclose projecting a high-intensity beam pattern on the surface of the crucible 6 surrounding Dietrich's bath 8. In the previous office actions and Appellants' responses thereto, the patentability of Claim 3 was addressed together with Claim 1. Consequently, the Examiner's argument that

> Dietrich et al teaches the capability (column 2, lines 53-58; "despite the force urging them radially toward the outside"; column 3, lines 25-30) of projecting each electron beam onto a surface portion of the crucible contiguous with the "bath of molten evaporate" (column 2, lines 40-55).
>
> Office Action of March 24, 2004, page 3.

was also directed to Claim 3. As in their arguments regarding the rejection of Claim 1, Appellants believe that projecting either of Dietrich's electron beams 17/18 onto the crucible 6 would require operating Dietrich's apparatus in a manner inconsistent with Dietrich's teachings, and for a reason not disclosed or suggested in Dietrich.

Furthermore, doing so would be contrary to Dietrich teachings that "[i]n electron beam melting units, it is important that the electron beam does not strike beside the material to be melted" (Column 1, Lines 23-25). Therefore, the Examiner's conclusion regarding the "capability" of Dietrich's apparatus is speculative at best, and in any event contrary to Dietrich's express teachings. Again, in response to this latter argument, the Examiner has argued:

> Applicant states that Dietrich's apparatus cannot project Dietrich's electron beams at Applicant's "interface" because Dietrich states "In electron beam melting units, it is important that the electron beam does not strike beside the material to be melted.", [sic] however, with respect to Dietrich's apparatus, Dietrich's statement does not directly translate to Dietrich's apparatus. Dietrich's "material to be melted" is his bath 9 [sic, bath 8], how can you not strike "beside the material"?To the contrary, as is further demonstrated by Dietrich that his electron beams can strike the "interface", Dietrich states "Thus, for example, the evaporation energy sources of the electron beam can be moved over the surface of the material to be evaporated such that as even a surface temperature as possible is reached on a specific surface, and therefore, a constant evaporation rate is maintained ." (column 1, lines 18-25).
>
> Advisory Action of June 18, 2004, page 2.

Because the Examiner's above argument is also directed to the subject matter of Claim 3, Appellants must again respond with the following:

(1) The Examiner does not cite Dietrich for support for his allegation that "Dietrich's statement does not directly translate to Dietrich's apparatus." As such, this argument must be viewed as personal opinion unless the Examiner supports the argument with facts cited from Dietrich or another prior art reference that contradicts the plain meaning of Dietrich's statement that, "[i]n electron beam melting units, it is important that the electron beam does not strike beside the material to be melted."

(2) The Examiner disputes what is meant by "strike beside the material to be melted" and striking the material itself. However, Appellants believe that a proper interpretation of the passage in dispute (Column 1, lines 23-25) would conclude that to "strike *beside* the material to be melted" (emphasis added) means to strike something nearby and other than the material to be melted. Dietrich's "material to be melted" is his bath 8, and Dietrich never discloses striking anything besides the bath 8, i.e., the crucible 6.

(3) The passage cited by the Examiner from Column 1, Lines 18-25, of Dietrich merely supports Appellants' argument that Dietrich discloses and teaches directing the electron beams 17 and 18 onto the surface 9 and nothing but the surface 9 of the bath 8, i.e., not on the crucible 6.

Finally, even if Dietrich's apparatus were to be operated so that one or both of the electron beams 17 and 18 is projected onto the crucible 6, there is not basis to conclude that the resulting beam pattern 26/27 would have a higher intensity on the surface portion of the crucible

6 than at the central region of the surface 9 of the bath 8, as also required by Claim 3.

In summary, Dietrich does not disclose that either electron beam 17/18 is projected onto a surface portion of the crucible 6 contiguous with the surface 9 of the bath 8, or that the beam pattern 26/27 has a higher intensity on the surface of the crucible 6 than at the central region of the bath surface 9. Therefore, Appellants believe that Dietrich also fails to disclose, either expressly or inherently, Appellants' invention as it is recited in Claim 3, and Appellants respectfully request that this Honorable Board of Appeals reverse the Examiner's rejection of Claim 3 under 35 USC §102.

(3) The Rejection of Claim 4 in view of Dietrich

Claim 4 depends from Claim 1, and introduces the additional limitation that

> the beam pattern has a perimeter on the surface portion [84] of the crucible [56], the electron beam [28] being incident on the surface of the coating material [26] at an oblique angle so as to establish relative to the electron beam gun a proximal point [100] and an oppositely-disposed distal point [101] at the perimeter of the beam pattern, the beam pattern having a lower intensity at the proximal and distal points [100,101] than elsewhere at the perimeter of the beam pattern.

Dietrich's electron beams 17 and 18 are also incident on the surface 9 of the bath 8 at oblique angles, and therefore establish relative to their respective EB guns 10 and 11 a proximal point (areas) 36 and 37 and oppositely-disposed distal points (terminal portions) 30/31 and 32/33 at the perimeter of each beam pattern 26 and 27. However, nothing in Dietrich discloses or suggests that the beam patterns 26 and 27 have a lower intensity at the proximal points 36 and

37 and distal points 30/31 and 32/33 than elsewhere along the perimeter of the beam patterns 26 and 27. Instead, viewing the graph in Figure 3 and considering that the semicircular beam patterns 26 and 27 are the result of pivoting the beams 17 and 18 (Column 3, Lines 37-38), it would appear that the intensity at the terminal portions 30-33 would be the same as the intensity at the proximal points 36 and 37 and every point in between.

For the above reasons, as well as the previous arguments directed to the rejection of parent Claim 1 on the basis of Dietrich, Appellants believe that Dietrich also fails to disclose, either expressly or inherently, Appellants' invention as it is recited in Claim 4, and Appellants respectfully request that this Honorable Board of Appeals reverse the Examiner's rejection of Claim 4 under 35 USC §102.

(4) The Rejection of Claims 6 and 7 in view of Dietrich

Appellants' independent Claim 6 recites an electron beam physical vapor deposition coating apparatus [10] that requires:

> a crucible [56] within the coating chamber [12];
> a coating material [26] surrounded by and contained within the crucible [56], the coating material [26] having a surface exposed by the crucible [56];
> an electron beam gun [30]; and
> an electron beam [28] projected by the electron beam gun [30] onto the surface of the coating material [26] and a contiguous surface portion [84] of the crucible [56], the electron beam [28] forming a beam pattern with a perimeter on the contiguous surface portion [84] of the crucible [56], the electron beam gun [30] melting the surface of the coating material [26] and evaporating molten coating material [26], the electron beam [28] having a higher intensity at an interface of the surface of the coating material [26] with the contiguous surface portion [84] of

> the crucible [56] than at a central region of the surface of the coating material [26], the electron beam [28] being incident on the surface of the coating material [26] at an oblique angle so as to establish relative to the electron beam gun [30] a proximal point [100] and an oppositely-disposed distal point [101] at the perimeter of the beam pattern, the electron beam [28] having a lower intensity at the proximal and distal points [100,101] than elsewhere at the perimeter of the beam pattern.

In view of the above, Claim 6 combines limitations from independent Claim 1 ("the electron beam [28] having a higher intensity at an interface of the surface of the coating material [26] with the contiguous surface portion [84] of the crucible [56] than at a central region of the surface of the coating material [26]"), its dependent Claim 3 ("an electron beam [28] projected by the electron beam gun [30] onto the surface of the coating material [26] and a contiguous surface portion [84] of the crucible [56]"), and its dependent Claim 4 ("the electron beam [28] having a lower intensity at the proximal and distal points [100,101] than elsewhere at the perimeter of the beam pattern"). Because Dietrich fails to individually disclose, either expressly or inherently, these limitations, Dietrich also fails to disclose, either expressly or inherently, these limitations in a single coating apparatus. Accordingly, Appellants respectfully request that this Honorable Board of Appeals reverse the Examiner's rejection of Claim 6 and its dependent Claim 7 under 35 USC §102.

(5) The Rejection of Claims 9 and 10 in view of Dietrich

Claims 9 and 10, which depend from Claims 1 and 6, respectively, introduce the additional limitation of

> means for projecting a separate beam pattern [97] on the crucible [56] for evaporating droplets of the molten coating material on the crucible [56], the separate beam pattern [97] having a higher intensity than the beam pattern on the coating material [26].

In view of the arguments set forth above regarding Dietrich's failure to locate the beam patterns 26 and 27 anywhere but within the central region of Dietrich's bath 8, it follows that Dietrich also fails to disclose projecting either of the beam patterns 26 and 27 as a separate beam pattern on the crucible 6 surrounding Dietrich's bath 6. As such, Dietrich also cannot be said to disclose such a separate beam pattern as having a higher intensity than either of the beam patterns 26 and 27 that Dietrich projects onto the surface 9 of the bath 8.

In the final rejection (Office Action of March 24, 204), the Examiner's argument for rejecting Claims 9 and 10 was that

> From the teachings of the beam geometry control above, it is appreciated that Dietrich can provide means for projecting a separate beam pattern (one of two) on the crucible surface (15, Figure 3) with a controlled intensity (38, Figure 3).
>
> Office Action of March 24, 2004, page 3.

However, even aside from the inoperability issue raised by the "separate" beam pattern 26/27 no longer striking the electrode 4 (see Appellants' arguments under the §102 rejection of Claim 1), this explanation fails to state where Dietrich discloses such a separated beam pattern has a higher intensity than the remaining beam pattern 26/27 that remains projected onto the surface 9 of the bath 8. Therefore, at best the Examiner's argument is that Dietrich's apparatus could be operated so that one of the beam patterns (26 or 27) is separated and projected onto the crucible

6, but such a result would have the separated beam pattern 26/27 with the very same intensity as the other beam pattern 26/27 that remains on the surface 9 of the bath 8. Because this is not the invention recited in Claims 9 and 10, Appellants respectfully request that this Honorable Board of Appeals reverse the Examiner's rejection of Claims 9 and 10 under 35 USC §102.

Rejection under 35 USC §103

Appellants respectfully traverse the 35 USC §103 rejection of Claims 5 and 8 for the reason that their invention is an unobvious improvement over the prior art when evaluated under the criteria established by the Supreme Court in *Graham v. John Deere,* 148 USPQ 459 (1966). Provided immediately below is a discussion of the scope and content of Dietrich as it applies to Claims 5 and 8, followed by remarks directed to the claims under this rejection.

Scope and Content of the Prior Art

Dietrich et al. ("Dietrich"), U.S. Patent No. 4,988,844

As summarized under Appellant's arguments directed to the 35 USC §102 rejection, Dietrich's electron beams 17 and 18 are incident on the surface 9 of the bath 8 at oblique angles so as to establish relative to their respective EB guns 10 and 11 a proximal point (areas) 36 and 37 and oppositely-disposed distal points (terminal portions) 30/31 and 32/33. However, as argued under the §102 rejection of Claim 4, nothing in Dietrich discloses or suggests that the beam patterns 26 and 27 have a lower intensity at the proximal points 36 and 37 and distal points 30/31 and 32/33 than elsewhere along the perimeter of the beam patterns 26 and 27.

Instead, viewing the graph in Figure 3 and considering that the semicircular beam patterns 26 and 27 are the result of pivoting the beams 17 and 18 (Column 3, Lines 37-38), it would appear that the intensity at the terminal portions 30-33 would be the same as the intensity at the proximal points 36 and 37 and every point in between.

Comparison of the Invention with the Teachings of the Prior Art

The Rejection of Claims 5 and 8 in view of Dietrich

Claims 5 and 8, which depend from Claims 1 and 6, respectively, introduce the additional limitation that

> the intensity of the beam pattern at the proximal and distal points [100,101] is about 30% to about 70% less than the intensity elsewhere at the perimeter of the beam pattern.

Under the §103 rejection, the Examiner explained

> Dietrich et al does not precisely teach the relative intensity, in percentages, as a function of position over a dimension of the crucible (column 4, line 63- column 5, line 2).
>
> It would have been obvious to one of ordinary skill in the art at the time the invention was made to configure the Dietrich et al relative intensity, in percentages, as a function of position over a dimension of the crucible whereby the intensity of the beam pattern at the proximal and distal points is about 30% to about 70% less than the intensity elsewhere at the perimeter of the beam.
>
> Motivation for configuring the Dietrich et al relative intensity, in percentages, as a function of position over a dimension of the crucible whereby the intensity of the beam pattern at the proximal and distal points is about 30% to about 70% less than the intensity elsewhere at the

> perimeter of the beam is drawn to applying the electron beams "symmetrically to the melting bath" (column 4, lines 51-55).

However, the above presumes that Dietrich discloses or suggests varying the intensity of Dietrich's beams 17 and 18 so that the resulting beam patterns 26 and 27 have a lower intensity at the proximal points 36 and 37 and distal points 30/31 and 32/33 than elsewhere at the perimeter of the beam patterns 26 and 27. As stated above, Appellants believe they have already established that this conclusion is incorrect.

In the final rejection (Office Action dated March 24, 2004), the Examiner made the argument that

> the features upon which applicant relies (i.e., "beam intensities at the proximal points (e.g., 36 and 37) and distal points (e.g., 30-33) of Dietrich's beam patterns 26 and 27 would be lower than elsewhere within the beam patterns 26 and 27") are not recited in the rejected claims.

To the contrary, this limitation is recited in Claims 4 and 6, from which Claims 5 and 8 depend. Accordingly, it appears the §103 rejection of Claims 5 and 8 was formulated without regard to this limitation from their parent Claims 4 and 6.

In view of the above, the Examiner might argue that it would be "obvious to try" varying the beam pattern intensity, or that it would be obvious to vary the intensity of the beam pattern on the ground that beam pattern intensity is a result-effective variable. However, "'obvious to try' is not a legitimate test of patentability" (*In re Fine*, 5 USPQ2nd 1596, 1599 (Fed. Cir. 1987); citing *In re Geiger*, 2 USPQ2nd 1276, 1278 (Fed. Cir. 1987), and *In re*

Goodwin, 198 USPQ 1, 3 (CCPA 1978)), and MPEP § 2144.05 addresses the latter by instructing that

> A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation.

The Examiner has not established that the intensity of a beam pattern between proximal and points thereof is a result-effective variable that one skilled in the art would try to optimize on the basis of routine experimentation. Accordingly, Appellants believe the rejection of Claims 5 and 8 is not proper without citing a secondary reference that recognizes that varying beam pattern intensity in the claimed manner as a result-effective variable.

For the above reasons, Appellant believes that the teachings of Dietrich applied by the Examiner fail to teach or even suggest Appellants' claimed invention recited in Claims 5 and 8. Appellants therefore respectfully request that this Honorable Board of Appeals reverse the Examiner's rejection of Claims 5 and 8 under 35 USC §103.

Application No. 09/624,810
Docket No. 13DV-13228
Appeal Brief dated August 23, 2004
Response to Final Rejection of March 24, 2004

CLOSING

In summary, Appellants respectfully disagree with the Examiner's rejections of Claims 1-10, and believe that their claimed EBPVD coating apparatus is novel and an unobvious improvement over the prior art applied by the Examiner, in accordance with the requirements of 35 USC §§102 and 103. For all of the reasons set forth above, Appellants respectfully request that this Honorable Board of Appeals reverse the Examiner's rejections of Claims 1-10 under 35 USC §§102 and 103.

Respectfully submitted,

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Attachments: Appendix A; Fee Transmittal form.

APPENDIX A

Claim 1: An electron beam physical vapor deposition coating apparatus comprising:

a coating chamber at an elevated temperature and a subatmospheric pressure;

a crucible within the coating chamber;

a coating material surrounded by and contained within the crucible, the coating material having a surface exposed by the crucible;

an electron beam gun; and

an electron beam projected onto the surface of the coating material by the electron beam gun, the electron beam defining a beam pattern having a higher intensity at an interface of the surface of the coating material with the crucible than at a central region of the surface of the coating material.

Claim 2: An electron beam physical vapor deposition coating apparatus according to claim 1, wherein the intensity at the central region of the surface of the coating material is substantially zero.

Claim 3: An electron beam physical vapor deposition coating apparatus according to claim 1, wherein the electron beam is also projected onto a surface portion

of the crucible contiguous with the surface of the coating material, the beam pattern having a higher intensity on the surface portion of the crucible than at the central region of the surface of the coating material.

Claim 4: An electron beam physical vapor deposition coating apparatus according to claim 1, wherein the beam pattern has a perimeter on the surface portion of the crucible, the electron beam being incident on the surface of the coating material at an oblique angle so as to establish relative to the electron beam gun a proximal point and an oppositely-disposed distal point at the perimeter of the beam pattern, the beam pattern having a lower intensity at the proximal and distal points than elsewhere at the perimeter of the beam pattern.

Claim 5: An electron beam physical vapor deposition coating apparatus according to claim 4, wherein the intensity of the beam pattern at the proximal and distal points is about 30% to about 70% less than the intensity elsewhere at the perimeter of the beam pattern.

Claim 6: An electron beam physical vapor deposition coating apparatus comprising:

a coating chamber containing a coating material, the coating chamber being at an elevated temperature and a pressure greater than 0.010 mbar;

a crucible within the coating chamber;

a coating material surrounded by and contained within the crucible, the coating material having a surface exposed by the crucible;

an electron beam gun; and

an electron beam projected by the electron beam gun onto the surface of the coating material and a contiguous surface portion of the crucible, the electron beam forming a beam pattern with a perimeter on the contiguous surface portion of the crucible, the electron beam gun melting the surface of the coating material and evaporating molten coating material, the electron beam having a higher intensity at an interface of the surface of the coating material with the contiguous surface portion of the crucible than at a central region of the surface of the coating material, the electron beam being incident on the surface of the coating material at an oblique angle so as to establish relative to the electron beam gun a proximal point and an oppositely-disposed distal point at the perimeter of the beam pattern, the electron beam having a lower intensity at the proximal and distal points than elsewhere at the perimeter of the beam pattern.

Claim 7: An electron beam physical vapor deposition coating apparatus according to claim 6, wherein the intensity at the central region of the surface of the coating material is substantially zero.

Claim 8: An electron beam physical vapor deposition coating apparatus according to claim 6, wherein the intensity of the beam pattern at the proximal and distal points is about 30% to about 70% less than elsewhere at the perimeter of the beam pattern.

Claim 9: An electron beam physical vapor deposition coating apparatus according to claim 6, further comprising means for projecting a separate beam pattern on the crucible for evaporating droplets of the molten coating material on the crucible, the separate beam pattern having a higher intensity than the beam pattern on the coating material.

Claim 10: An electron beam physical vapor deposition coating apparatus according to claim 1, further comprising means for projecting a separate beam pattern on the crucible for evaporating droplets of the molten coating material on the crucible, the separate beam pattern having a higher intensity than the beam pattern on the coating material.